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IS 9002-14 (1985): Equipment for Environmental Tests for Electronic and Electrical Items, Part 14: Low Air Pressure Chamber [LITD 1: Environmental Testing Procedure]

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Indian Standard
SPECIFICATION FOR
EQUIPMENT FOR ENVIRONMENTAL
TESTS FOR ELECTRONIC AND
ELECTRICAL ITEMS

PART 14 LOW AIR PRESSURE CHAMBER

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

**SPECIFICATION FOR
EQUIPMENT FOR ENVIRONMENTAL
TESTS FOR ELECTRONIC AND
ELECTRICAL ITEMS**

PART 14 LOW AIR PRESSURE CHAMBER

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Indian Standard

**SPECIFICATION FOR
EQUIPMENT FOR ENVIRONMENTAL
TESTS FOR ELECTRONIC AND
ELECTRICAL ITEMS**

PART 14 LOW AIR PRESSURE CHAMBER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 21 May 1985, after the draft finalized by the Environmental Testing Procedure Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 The object of this standard (Part 14) is primarily to guide the environmental equipment manufacturers with respect to broad specifications for their equipment and to assist the users of such equipment to properly define their requirements in the indent for the equipment. The requirements of the equipment largely depend on the environmental conditions to be simulated or created. It is expected that this standard will harmonize the requirements of the equipment produced by different manufacturers.

0.3 Certain requirements have been specified in a general form in view of practical difficulties in defining such requirements quantitatively. It is presumed that with the experience gained, more precise requirements will be laid down for such equipment.

0.4 An overall performance assessment of the complete equipment for a short duration has been included although it may be realised that it may not be entirely sufficient. This will at least ensure the functional performance and operability of the equipment. Many of the constructional requirements specified can be checked through visual examination.

0.5 In view of the objective nature of some of the requirements, sufficient care shall be taken in using this standard.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard (Part 14) lays down guiding requirements for the design of low air pressure chamber required for carrying out low air pressure test at ambient temperature in accordance with IS : 9000 (Part 13)-1981*.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions and explanation of terms given in IS : 9000 (Part 1)-1977† shall apply.

3. LOW AIR PRESSURE

3.1 The chamber shall be capable of maintaining the specified low air pressure in the working space, within the tolerance required, at any point in the working space of the chamber, for the specified duration.

3.1.1 The normal preferred pressure ranges shall be between normal atmospheric pressure down to 0.15 kPa with tolerance of ± 5 percent or 0.1 kPa whichever is greater.

3.1.2 The requirement and the size of chamber in which the effect of free air conditions are simulated are given in Appendix A.

4. CONSTRUCTION, WORKMANSHIP AND FINISH

4.1 General

4.1.1 The chamber shall be fabricated preferably with stainless steel of sufficient thickness to provide necessary mechanical strength. Corners and seams of the interior liners are to be so welded to allow for expansion and contraction under all temperature changes to prevent distortion and damage. Safety factor for thickness of the sheet shall be taken into consideration.

4.1.2 The materials used for the construction of interior walls of the chamber shall be of stainless steel of non-corrosive type preferably.

4.1.3 The walls of the chamber shall be near to thermal black and shall have an emissivity coefficient of not less than 0.7.

4.2 Working Volume — The working volume of the chamber shall be chosen from the following preferred values, unless otherwise specified:

0.25, 0.5, 1, 2.5 m³.

*Basic environmental testing procedures for electronic and electrical items: Part 13 Low air pressure test.

†Basic environmental testing procedures for electronic and electrical items: Part 1 General.

4.3 Door — Top opening/detachable door shall be provided. The chamber shall be provided with suitable heavy duty hinges, nuts for tightening the door and fitted with silicon gasket to prevent the air leakage preferably on a cut groove.

4.4 Shelves — Removable perforated shelves capable of supporting without distortion the items of specified mass shall be provided. The number of shelves and adjustable heights are to be as specified.

4.5 Viewing Window — A viewing window of the required dimension shall be provided on the door preferably of the multipanel type, hermetically sealed.

4.6 Terminal Panel — A suitable terminal panel for making external connection of specified voltage and current level shall be provided. The relevant details and requirements, for example, voltage and current levels, are to be as specified.

4.7 Port Hole — One or more port hole of specified dimension shall be provided at the specified point of the chamber for accomodating wires, hoses, etc. Means shall be provided for sealing of the port hole when not in use to ensure thermal integrity.

4.8 Interior Light — Provision shall be made for illuminating the working space by incandescent lamps. The lamps shall be so positioned as not to project into the working space.

4.9 Workmanship — Workmanship shall be of good current engineering practice.

4.10 Finish — The external and internal finish shall be as specified so as to ensure protection against corrosion and other similar effects.

4.11 Castor Wheels — Suitable size of four castor wheels (Swivel type) shall be provided, for easy portability of the equipment.

4.12 Miscellaneous

4.12.1 The chamber shall be designed for optimum performance and economic continuous operation with minimum maintenance requirement. It shall occupy minimum floor area.

4.12.2 The electrical and electronic components and cables should conform to relevant Indian Standards, wherever applicable.

4.12.3 A suitable vacuum pump with belt guard for the motor shall be provided to the chamber to achieve any vacuum from atmospheric pressure down to the 0.15 kPa in a specified period. The pump is incorporated with suitable system such that ultimate vacuum/low air pressure is obtained

in step for the entire range of pressure. The chamber should be provided with a vacuum inlet pipe for evacuation purpose. Measuring and indicating device shall be incorporated.

4.12.4 The vacuum pump shall be provided with pressure-regulating valve, pressure-relief valve and indicating device with automatic cut-in and cut-out arrangement for any desired pressure.

4.12.5 The connecting line between the pump and the chamber to be evacuated shall be as short as practical and also free from the bends. The inner diameter of the tube should be at least as large as inside diameter of the pump. A good vacuum tight, joint between the pump intake and connecting line can readily be made by sliding the correct size, heavy walled reinforced rubber tubing over the intake nipple. Insert the connecting line into the tubing so that it butts flush against the nipple. Silicon grease shall be used as a sealant at the joint.

4.12.6 The pump shall be provided with oil level window and indication of oil level (externally).

4.12.7 A suitable filter shall be provided to separate foreign materials in the oil.

5. INSTRUMENT CONSOLE

5.1 An instrument console consisting of required instruments should preferably be fitted to the chamber for ease of operation. The instrument console should include the following:

- a) Indicating panel consisting of mains on-off switch, mains-on indicator lamp, temperature indicator, on-off switch for air circulation;
- b) Necessary instruments for controlling and recording of pressure;
- c) Input regulation to ensure close pressure accuracy and for modulating, that is, adjusting, regulating or varying vacuum capacities in steps; and
- d) A suitable automatic pressure adjustment valve to control and maintain any specified range of pressure.

6. POWER SUPPLY REQUIREMENTS

6.1 The test equipment shall be capable of operating from an ac supply of 50 Hz either from single phase 240 V \pm 10 percent or three phase 415 V \pm 10 percent. Total power supply input shall be declared by the manufacturer as required by the purchaser.

7. SAFETY

7.1 Adequate electrical safety arrangement shall be incorporated in the chamber design to avoid electric shocks to personnel and damage to the chamber.

7.2 The safety precautions should be as follows:

- a) Protection against supply voltage variation;
- b) Safety cut-outs for low air pressure; and
- c) Safety alarm (visual and/or audio), when required.
- d) Protection against single phasing as well as phase reversal, where applicable.

8. MARKING

8.1 The chamber shall be marked with the following information:

- a) Manufacturer's name or trade-mark;
- b) Type designation;
- c) Working volume and range of operating conditions;
- d) Power supply requirements; and
- e) Any other additional marking as required.

8.1.1 The chamber may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

9. TESTS

9.1 Each chamber shall be subjected to the following tests:

- a) Visual examination and inspection; and
- b) Performance.

9.2 Visual Examination — Each chamber shall be visually examined and inspected for compliance with the relevant requirements of the standard.

9.3 Performance — Each chamber shall be subjected to performance run at specified pressure for a minimum period of 96 hours continuously. Pressure shall be recorded through out the test and the observed performance should meet the specified requirements.

10. INSTRUCTION MANUAL

10.1 Each chamber shall be provided with instruction manual which shall contain the following:

- a) Operating instructions;
- b) Maintenance and service instruction;
- c) Schematic diagrams and design of lay-out;
- d) List of component parts with performance data; and
- e) List of spare parts.

11. INFORMATION TO BE FURNISHED BY THE INDENTOR

11.1 The following information shall be furnished by the indentor:

- a) Pressure range of the chamber, if other than 0.15 kPa (*see 3.1.1*);
- b) Duty cycle;
- c) Number of shelves and adjustable height (*see 4.4*);
- d) Dimensions of viewing window (*see 4.5*);
- e) Relevant details and requirements of terminal panels (*see 4.6*);
- f) Dimensions of port hole (*see 4.7*);
- g) External and internal finish (*see 4.10*);
- h) Provision of castor wheels (*see 4.11*);
- j) Interlock provision if required;
- k) Automatic test programming, if required;
- m) Total power supply input (*see 6*);
- n) Safety alarm if required (*see 7.2*); and
- p) Any other characteristics or parameters with tolerances.

A P P E N D I X A

(*Clause 3.1.2*)

VOLUME OF TEST CHAMBER

A-0. GENERAL

A-0.1 The size of the chamber shall be such that the conditions stated below are satisfied.

A-1. VOLUME OF ITEM $\leq 1 \text{ dm}^3$

A-1.1 Power Dissipation Equal to or Less Than 50 W — The minimum distance between any surface of the test item and the corresponding wall of the chamber shall be not less than 10 cm.

A-1.2 Power Dissipation Greater than 50 W or Less Than 100 W — The minimum distance between any surface of the test item and the corresponding wall of the chamber shall be not less than 20 cm.

A-2. VOLUME OF ITEM $> 1 \text{ dm}^3$

A-2.1 The ratio between the volume of the chamber and the volume of the item shall be not less than 8:1. The item, as far as possible, shall be placed close to the centre of the test chamber so as to have as much as possible space between any part of the test item and the chamber walls.

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